

(12) UK Patent Application (19) GB (11) 2 230 459 (13) A

(43) Date of A publication 24.10.1990

(21) Application No 8908441.2

(22) Date of filing 14.04.1989

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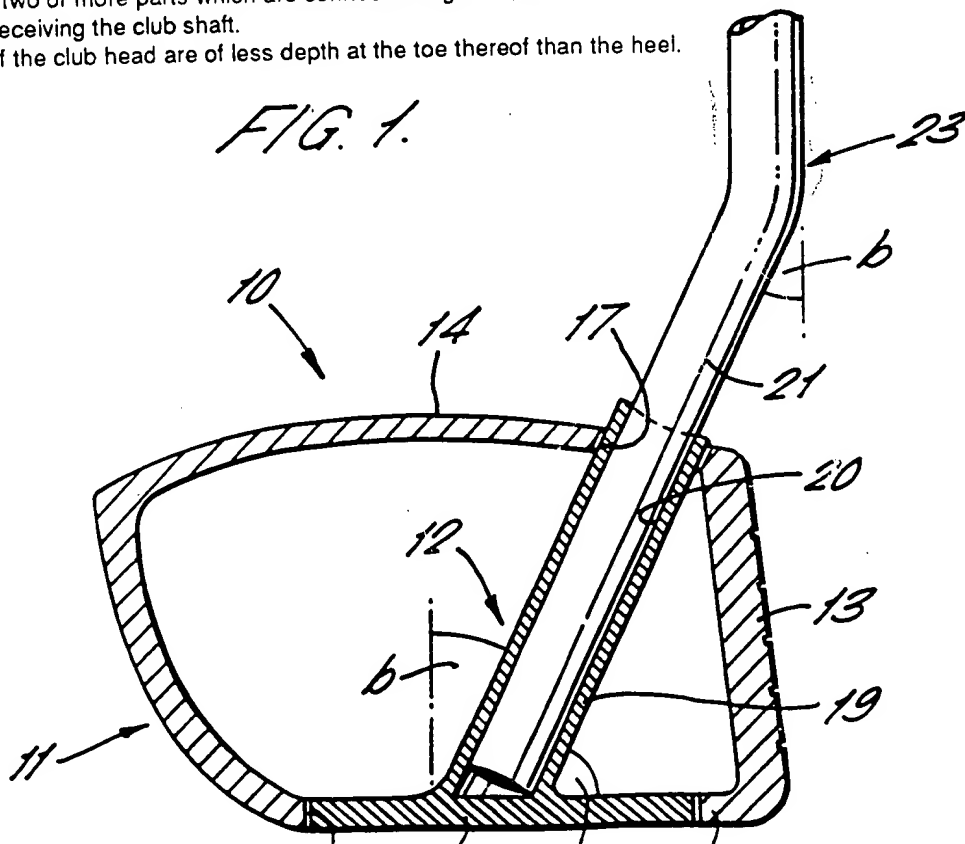
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26 Caxton Street, London, SW1H 0RJ, United Kingdom(51) INT CL⁸
A63B 53/04 53/12(52) UK CL (Edition K)
A6D D21C D23B(56) Documents cited
GB 2016281 A GB 1475011 A US 4063737 A
US 3759517 A US 3640534 A(58) Field of search
UK CL (Edition J) A6D
INT CL⁸ A63B
Online databases: WPI

(54) Improvements in golf clubs

(57) A golf club comprises a club head assembly (11) to which is connected a shaft assembly (23). There is a bend in the shaft assembly which means that the club assembly is offset from the axis of the shaft assembly. The angle of offset is chosen, together with the weight distribution and dimensions of club head and shaft assemblies, so that the assembled club has a desired "bias angle" (i.e., the angle which the club face makes with the vertical when the club is placed on a horizontal surface with the club head assembly hanging freely).

The club head is made in two or more parts which are connected together, and there is a socket which is connected to both parts and has a bore for receiving the club shaft.

The grooves in the face of the club head are of less depth at the toe thereof than the heel.



IMPROVEMENTS IN GOLF CLUBS

This invention relates to golf clubs.

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In manufacturing golf clubs, it is important to be able to control the distribution of weight within the club head and for the club head to have a strong and rigid construction. It is further important that
10 the club head has a firm fixed fitting on the end of a shaft.

In a first aspect the present invention provides a club head for a golf club known as a wood which is characterised in that the head is made in two or more
15 parts which are connected together and a socket within the head is provided which is connected to both parts and which has a bore therein for receiving the end of a shaft for connection of the club head to the shaft. The socket may be provided as a separate element and
20 may be made in one piece. The socket may be connected to one of said parts of the head through being formed, eg cast, integrally therewith. The socket may be connected to one of said parts by welding, fusing or adhesive. The socket may comprise separate
25 interfitting elements which are themselves connected, e.g. cast, to said parts of the head.

The socket is preferably arranged so that it receives the end of the shaft with the shaft penetrating to the sole of the club head. The club
30 head may be without the usual hosel extending up the shaft from the club head. The parts of club head are preferably made as shell sections and form a hollow club head.

In another aspect the invention provides a
35 method of assembly of a golf club using an elongate shaft and a club head, in which a bend is provided in

the shaft so that a lower end portion of the shaft lies at an angle to the longitudinal axis of the shaft and a bore is provided in the club head for receiving said lower end portion of the shaft, which method
5 includes the step of selecting a "bias angle" (as defined herein) for the assembled club in dependence upon the swing characteristics of the intended user and connecting together the club head and shaft such that the assembled club has said desired "bias angle".

10 The "bias angle" may be chosen to be substantially 45° (the "neutral bias angle"), greater than the "neutral bias angle", e.g., for slicers of the ball or less than the "neutral bias angle", e.g., for hookers of the ball.

15 In a further aspect, the invention provides that the grooves on the face of a club head are arranged to be of less depth at the toe of the club head than at the heel of the club head to provide compensation for off-centre strikes of a golf ball and resultant
20 differences in trajectory.

By way of example, embodiments of the invention will now be described with reference to the accompanying drawings, in which:

Figure 1 is a sectional view through a club head
25 in accordance with the invention,

Figure 2 is a view of the face of the club head of Figure 1,

Figure 3 is a view of the top of the club head of Figure 1,

30 Figures 4 and 5 show the club head with different shafts attached,

Figure 6 diagrammatically illustrates the "bias angle" of a conventional golf club, and

35 Figure 7 diagrammatically illustrates the "bias angle" of a golf club in accordance with the present invention.

In Figure 1 there is seen a club head 10 for a golf club known as a "wood". The club head 10 here is made of metal, which is preferably steel. Other materials, eg carbon or graphite could equally well be used. The club head 10 is of a hollow shell structure and comprises interfitting first and second shell parts 11, 12. The interior of the finished club head normally contains a filler, eg foam.

The first part 11 here comprises the main body of the club head, including the ball-striking section 13, the top 14 and bottom 15. A recess 16 is provided in the bottom 15 of the club head and a hole 17 is provided in the top 14 of the club head.

The second shell part 12 here comprises a sole plate 18 which is configured and arranged for receipt in the recess 16, as is seen in Figures 1 and 3. The sole plate 18 is attached, eg by welding, around its periphery in the recess 16 to the bottom 15 of the club head. The club head 10 additionally comprises a socket 19. Here, the socket 19 is provided as an integral part of the sole plate 18, eg by being cast therewith. The socket 19 can alternatively be a separate part and connected to the sole plate 18, eg by welding. The socket 19 extends from the sole plate 18 so as to be engagable in the hole 17 when the sole plate is received in the recess 16, as seen in Figure 1. The socket 19 is attached, e.g. by welding, around its periphery in the hole 17 to the top 14 of the club head. The socket 19 may extend slightly proud of the top 14 of the club head, as seen in Figure 1. This construction of club head, with the two shell parts connected together at the top and bottom of the head and the socket extending therebetween, provides a very effective rigid and strong structure. It also means that the weight of the head is distributed advantageously in a region giving optimum feel and

weight behind a shot.

It will be understood that the configurations of the interfitting parts of the club head may be varied. For example, more than two shell parts may be used and the socket may be formed in more than one piece, possibly as part of the shell parts themselves.

The socket 19 defines a bore 20 for receiving the end of a shaft 21. The shaft 21 is retained in the bore 20 by adhesive, and grooves may be provided on the inside of the bore to enhance the security of the shaft in the bore. The absence of the usual neck or "hosel" on the top of the club head reduces the effect of drag when the club is swung.

Here, the club head is seen with a shaft 21 having a bend 23. The angle a of the axis of the bore 20 of the socket element 19 relative to the sole plate 18 is chosen to complement the angle b of the bend 23 in the shaft 21. In particular, angles $a+b = 90^\circ$. One purpose of the bend b in the shaft is to set the club head relative to the shaft, and in particular to the golfer's hands, so that the face of the club head is at least no further forward than the longitudinal axis 22 of the shaft. This is illustrated in Figures 4 and 5. In Figures 4 and 5, the amount of "set" in the club is adjusted by varying the length of the bent end portion of the shaft. In addition or alternatively, the amount of "set" in the club could be adjusted by varying the angle b of the bend in the shaft. In Figure 4, the face of the club head is as far forward as the longitudinal axis 22 of the shaft, whereas in Figure 5, the face is set back by the distance of half a golf ball's diameter d . In Figures 4 and 5 the angles a and b can be seen. Angle c in Figure 2 represents the angle of lie of the club, and the socket is arranged to suit this angle also.

The technology of bending shafts is known and is

therefore not explained in detail here. Suffice it to say that care is taken when bending the shaft to ensure the cross-section of the shaft remains circular.

Another purpose of the bend 23 in shaft 21 is to enable the golf club to be set up with a desired "bias angle" to suit the particular swing characteristics of individual golfers. The "bias angle" is defined herein as the angle which the plane of the face of the club head subtends to the vertical when the club is placed with its shaft on a horizontal surface and its head is allowed to overhang the surface and rest freely. Figures 6 and 7 are illustrations showing the "bias angle" α of a conventional golf club and a golf club according to the present invention, respectively. The golf clubs seen in Figures 6 and 7 are "woods", but the "bias angle" principle may also be applied to golf clubs known as "irons" and "putters".

The "bias angle" α may be selected to be substantially 45° ("neutral bias angle"). This can be achieved by arranging for the axis of the lower (bent) portion of the shaft to intersect the centre of mass of the club head. Variable weighting for such a club has to be effected on the midline of the sole (imaginary line which bisects the club head into two equal masses) if the "bias angle" is not to be disturbed. A golf club with a "neutral bias angle" will be dynamically balanced since no internal forces will be present during the swing tending either to open or close the club face. A golf club with a "neutral bias angle" is seen in Figure 7, and this mimics the correct position of the shaft and club head at the top of the backswing.

If the "bias angle" is altered from the "neutral bias angle", the effect of this will be to relocate the centre of mass of the club head relative to the

shaft. This will mean that instead of there being a dynamic balance of the club in motion, internal forces will be present in the club which create a tendency for the face of the club to be turned towards either a more open or more closed position. This effect can be used as a corrective measure to counter a natural tendency which an individual golfer may have of opening or closing the club face during the swing. For example, for golfers who tend to fade or slice the ball and for whom the club face tends to be too open at the top of the backswing, a "bias angle" greater than the "neutral bias angle" is selected, say 60° , so that the internal forces present in the swing will be urging the club face towards a less open position. For golfers who tend to draw or hook the ball and for whom the club face tends to be too closed at the top of the backswing, a "bias angle" less than the "neutral bias angle" is selected, say 30° , so that the internal forces present in the swing will be urging the club face towards a less closed position.

The "bias angle" of a club is selected by suitably adjusting the angle and length of the (bent) lower end portion of the shaft and matching this with a suitable configuration of the bore in the club head. Where the club head is one which is made in accordance with the foregoing description, this means suitably configuring the socket 19. Conventional golf clubs are not set up with a selected "bias angle". It happens that the "bias angle" of conventional woods, as seen in Figure 6, usually turns out to be about 20° or less.

Reference 24 designates grooves on the face of the club head. The grooves 24 impart backspin to the golf ball when it is struck, encouraging greater height to the ball's trajectory. A ball struck from towards the toe of the face of a club head has a

tendency to rise higher than one struck from towards
the heel of the face. Accordingly, the depth of the
grooves 24 is arranged to be less at the toe than at
the heel to provide compensation for strikes of golf
5 balls which are off-centre.

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CLAIMS

5 1. A club head for a wood which is
characterised in that the head is made in two or more
parts which are connected together and a socket within
the head is provided which is connected to both parts
and which has a bore therein for receiving the end of
10 a shaft for connection to the club head of the shaft.

 2. A club head as claimed in Claim 1 wherein
the socket is provided as a separate element.

15 3. A club head as claimed in Claim 2 wherein
the socket is made in one piece.

 4. A club head as claimed in any preceding
claim wherein the socket has a connection with one of
20 said parts through being formed, eg cast, integrally
therewith.

 5. A club head as claimed in any preceding
claim wherein the socket has a connection with one of
25 said parts by welding, fusing or adhesive.

 6. A club head as claimed in any preceding
claim wherein the socket is arranged so that it
receives the end of the shaft with the socket and
30 shaft penetrating to the sole of the club head.

 7. A club head as claimed in any preceding
claim wherein the club head is without a hosel
extending up the shaft from the club head.

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 8. A club head as claimed in any preceding

claim wherein the parts of club head are made as shell sections and form a hollow club head.

9. A club head substantially as herein
5 described with reference to the accompanying drawings.

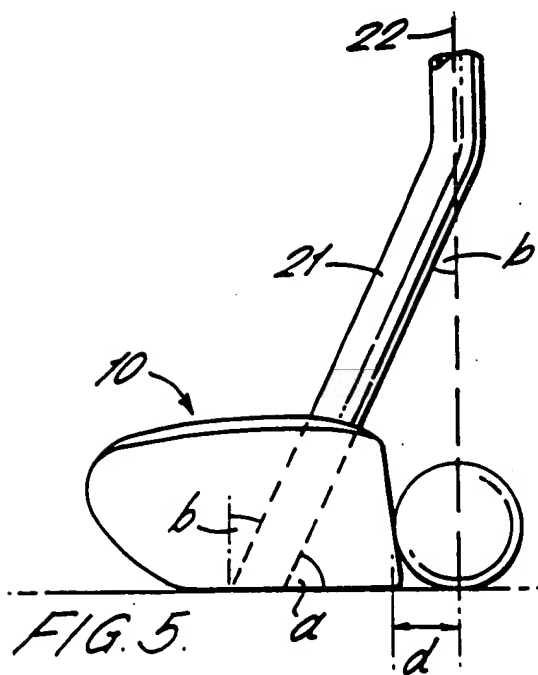
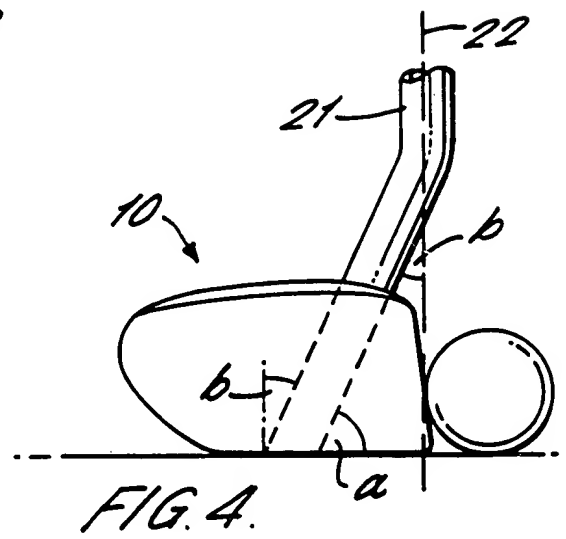
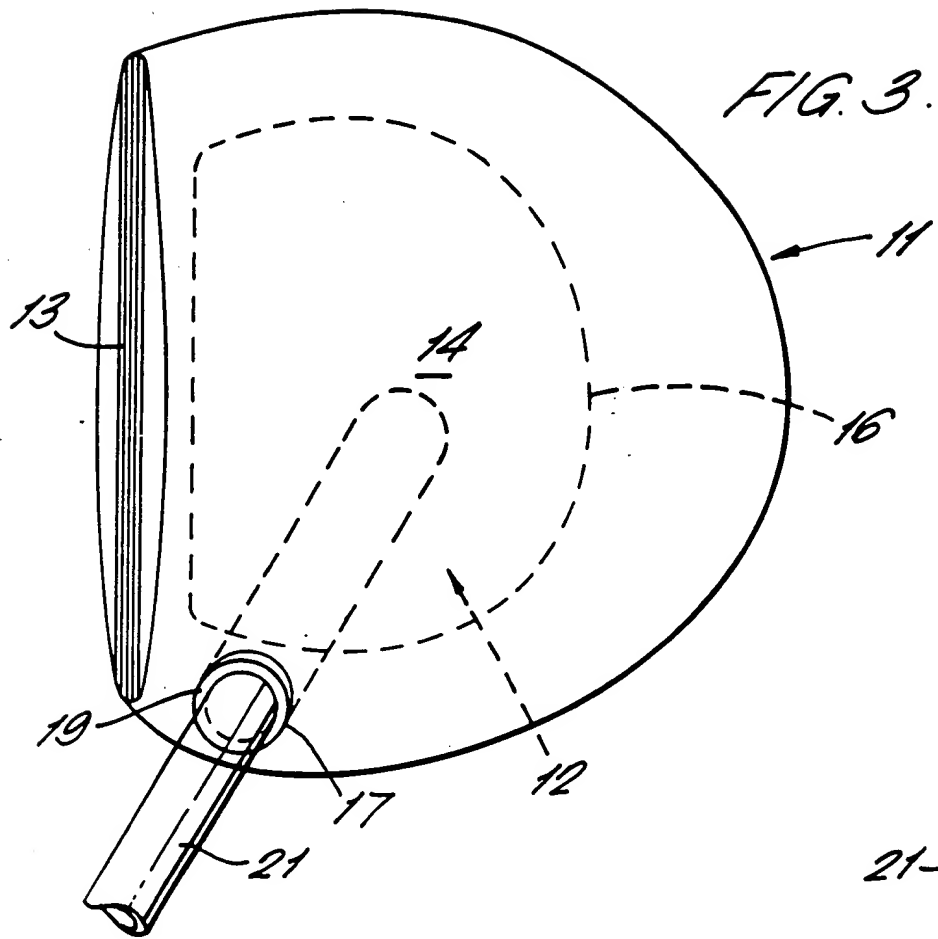
10 10. A method of assembly of a golf club using
an elongate shaft and a club head, in which a bend is
provided in the shaft so that a lower end portion of
the shaft lies at an angle to the longitudinal axis of
the shaft and a bore is provided in the club head for
receiving said lower end portion of the shaft, which
method includes the step of selecting a "bias angle"
(as defined herein) for the assembled club in
15 dependence upon the swing characteristics of the
intended user and connecting together the club head
and shaft such that the assembled club has said
desired "bias angle".

20 11. A method as claimed in claim 10 or claim
11 wherein the club head comprises a club head as
claimed in any one of claims 1 to 9.

25 12. A club head for a golf club wherein the
grooves on the face of the club head are arranged to
be of less depth at the toe of the club head than at
the heel of the club head.

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